

**Mass & Weight Problems**

$g_{\text{earth}} = 10 \text{ m/s}^2$

$g_{\text{moon}} = 1.6 \text{ m/s}^2$

$g_{\text{mars}} = 3.7 \text{ m/s}^2$

$g_{\text{Jupiter}} = 24.8 \text{ m/s}^2$

1. What is the force of gravity on a person of mass 55 kg on the earth?

$w = mg$

$w = (55)(10)$

$w = 550 \text{ N}$

2. How much does a 75 kg person weigh on the earth?

$w = mg$

$w = (75)(10)$

$w = 750 \text{ N}$

3. How much would a 75 kg person weigh on the moon?

$w = mg$

$w = (75)(1.6)$

$w = 120 \text{ N}$

4. What is the mass of a person who weighs 950 N on the earth?

$w = mg$

$950 = m(10)$

$m = 95 \text{ kg}$

5. What is the mass of a person who weighs 140 N on the moon?

$w = mg$

$140 = m(1.6)$

$m = 87.5 \text{ kg}$

$mg = Mg$

6. Object A weighs 100 N on the earth while Object B weighs 100 N on the moon.

- a. Which has more mass?

B. less "g" on moon, so needs more "m" to have same weight

- b. Which would be more difficult to pick up and hold? Why?

Same. They weigh the same

- c. Which would be more difficult to push sideways? Why?

B. It has more mass so more inertia.

7. How much would a container of milk that weighs 20 N on the earth weigh on Jupiter?

$w = mg$

$20 = m(10)$

$m = 2 \text{ kg}$

$w = mg$

$w = (2)(24.8)$

$w = 49.6 \text{ N}$

8. If a person weighs 1500 N on Jupiter, how much would they weigh on Mars?

$w = mg$

$1500 = m(24.8)$

$m = 60.5 \text{ kg}$

$w = mg$

$w = (60.5)(3.7)$

$w = 224 \text{ N}$

9. An astronaut on a far away planet drops a 50 kg backpack from a height of 1.5 meters. It falls for 2.2 seconds. How much does the backpack weigh on that planet?

$y = -\frac{1}{2}gt^2 + v_i t + y_i$

$0 = -\frac{1}{2}g(2.2)^2 + 1.5$

$g = 0.62 \text{ m/s}^2$

$w = mg$

$w = (50)(0.62)$

$w = 31 \text{ N}$

Answers:

1) 550 N

2) 750 N

3) 120 N

4) 95 kg

5) 87.5 kg

6. a) B

b) same; same weight

c) B; more mass

7) 49.6 N

8) 224 N

9) 31 N ( $g = 0.62 \text{ m/s}^2$ )